



# ***Medical NBC Briefing Series***

## **Medical NBC Aspects of Bubonic Plague**





# Purpose

- *This presentation is part of a series developed by the Medical NBC Staff at The U.S. Army Office of The Surgeon General.*
- *The information presented addresses medical issues, both operational and clinical, of various NBC agents.*
- *These presentations were developed for the medical NBC officer to use in briefing either medical or maneuver commanders.*
- *Information in the presentations includes physical data of the agent, signs and symptoms, means of dispersion, treatment for the agent, medical resources required, issues about investigational new drugs or vaccines, and epidemiology.*
- *Notes page.*



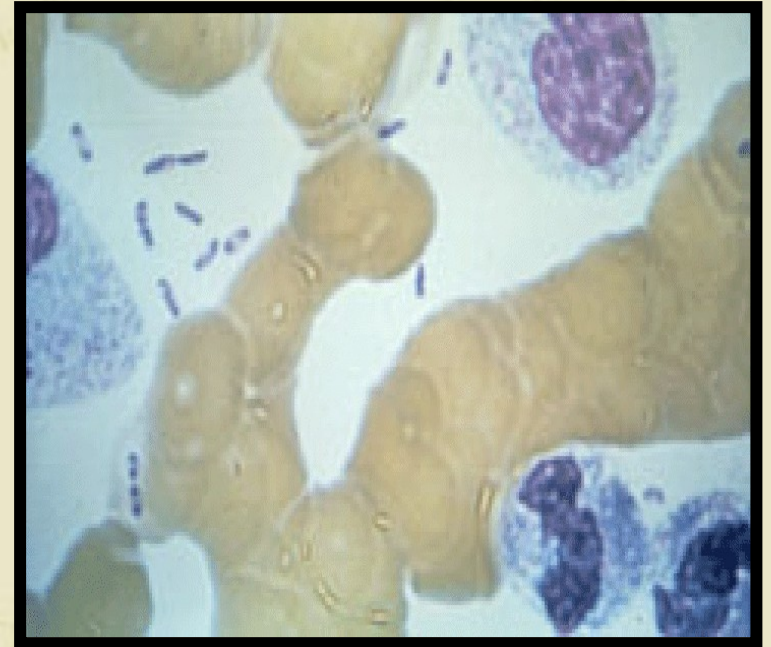
Office of the Surgeon General  
for the Army





# Outline

- **Background**
- **Battlefield Response**
- **Medical Response**
- **Command and Control**
- **Summary**
- **References**





# Background

- **Disease Background**
- **History**
- **Bubonic Plague Disease Course Summary**
- **Signs and Symptoms**
- **Diagnosis**
- **Treatment**
- **Current Situation**
- **Weaponization**

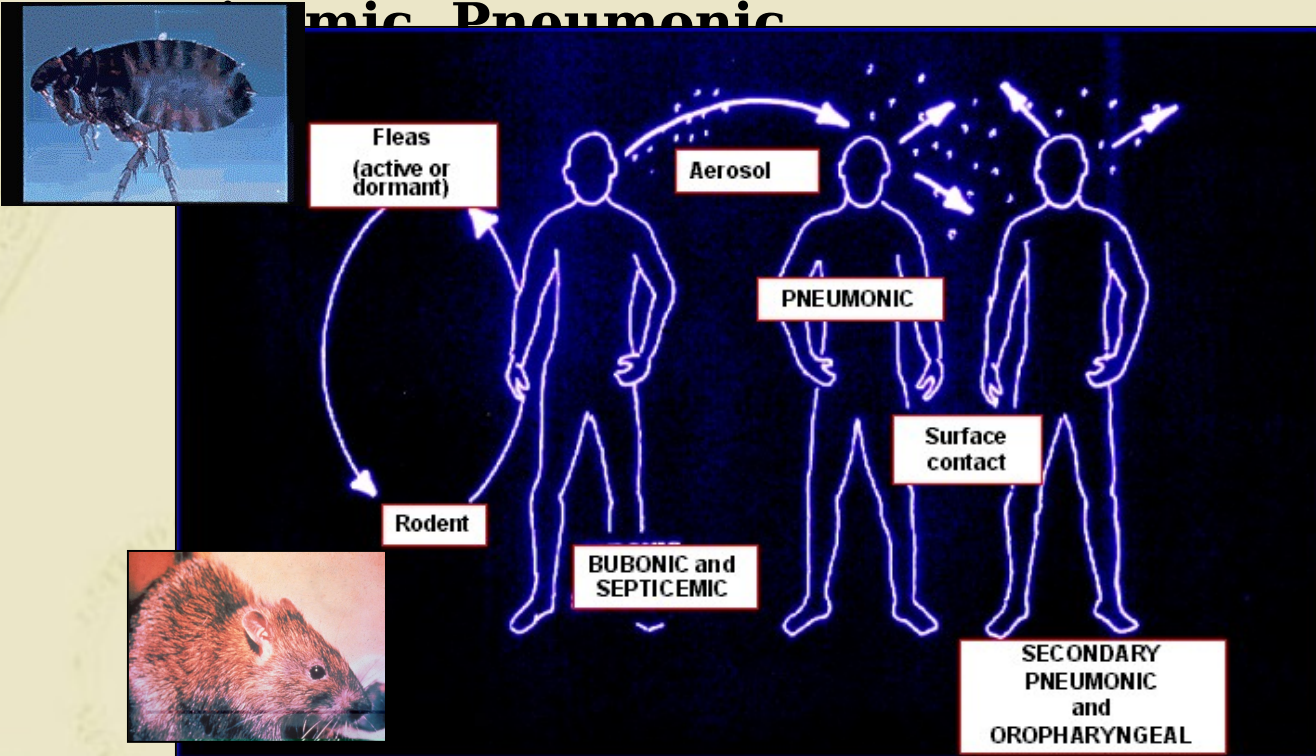






# Disease Background

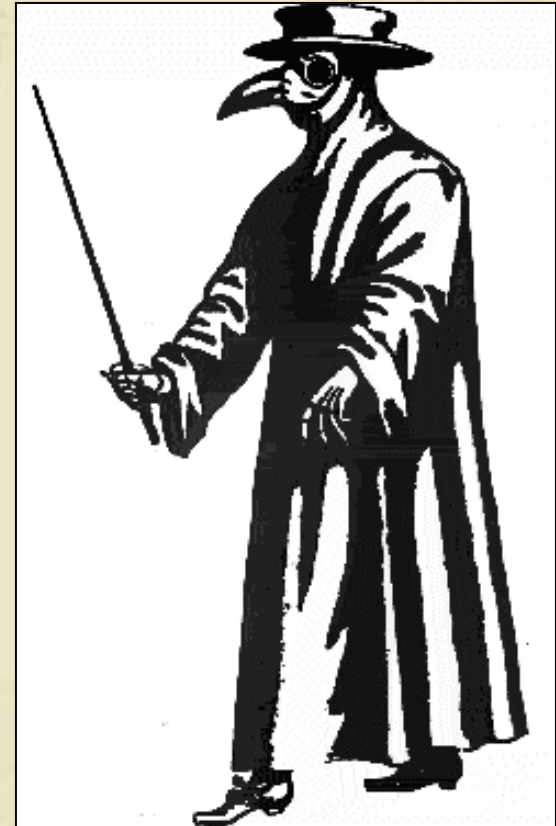
- **Bacteria:** *Yersinia pestis*
- **Vector:** flea (*Xenopsylla cheopis*)
- **Three forms of Plague:** **Bubonic**, Primary  
pneumonic





# History

- **Ancient - first cited in I Samuel V:6,9 - 1320 BC**
- **Major Pandemics**
  - 541 AD - Plague of Justinian
  - 1346 AD - 'Black Death'
  - 1894 AD - Modern Pandemic
- **200,000,000 deaths have been attributed to plague**
- **Bubonic plague has been the dominant manifestation**







# Bubonic Plague Disease Course

|  |        |        |        |        |        |        |
|--|--------|--------|--------|--------|--------|--------|
| Day 1<br><b>EXPOSURE</b>   | Cay 2  | Day 3  | Day 4  | Day 5  | Day 6  | Day 7  |
| <b>Summary</b>   |        |        |        |        |        |        |
| Ambulatory or littered based on severity of symptoms                       |        |        |        |        |        |        |
| Acute malaise, high fever, chills, headache, nausea vomiting               |        |        |        |        |        |        |
| One or more tender lymph nodes   |        |        |        |        |        |        |
| Incubation on 2-10 DAYS  |        |        |        |        |        |        |
| Day 8  | Day 9  | Day 10 | Day 11 | Day 12 | Day 13 | Day 14 |
| Patients Littered  |        |        |        |        |        |        |
| Visible Bubo, intense pain, bladder distention, fright, confusion, anxiety |        |        |        |        |        |        |
| incubation   |        |        |        |        |        |        |
| Day 15   | Day 16 | Day 17 | Day 18 | Day 19 | Day 20 | Day 21 |
| Patients Littered  |        |        |        |        |        |        |
| Development into systemic disease or pneumonic plague leading to death     |        |        |        |        |        |        |
| Airborne transmission from person to person                                |        |        |        |        |        |        |
| Day 22   | Day 23 | Day 24 | Day 25 | Day 26 | Day 27 | Day 28 |



# Signs and Symptoms

- Sudden onset
- Flu-like syndrome - malaise, high fever
- Tender lymph nodes - buboes
- Inguinal lymph node involvement most common
- 50% mortality if untreated
- 80% are secondarily septicemic







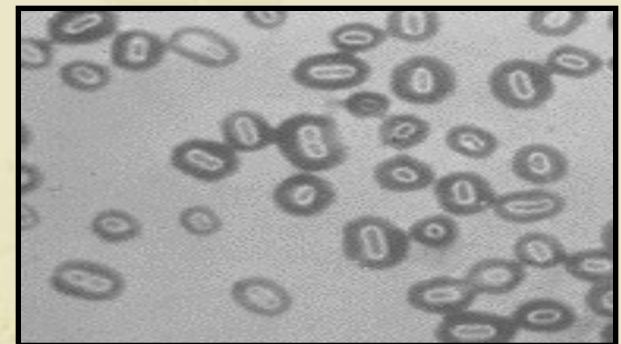
# Signs and symptoms (cont.)





# Laboratory Diagnosis

- Cultures from blood, sputum, and bubo aspirates
- Requires a minimum BL-2 laboratory with respiratory isolation protection
- Handling specimens should be with glove and mask precautions

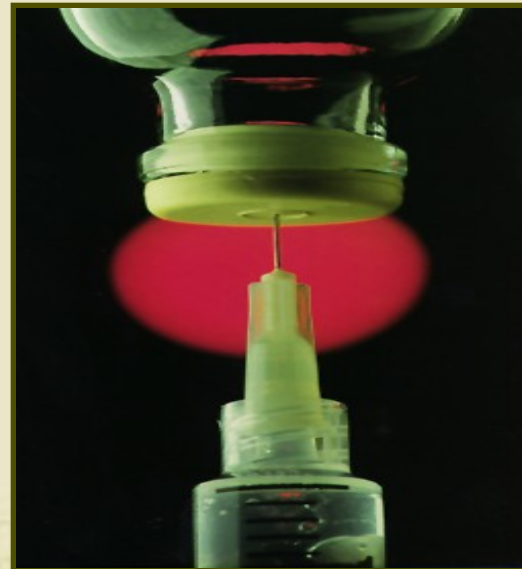






# Treatment - Prophylaxis

- **Plague vaccine**
  - 3doses:
    - Initial dose
    - 1 month
    - 6 months
- **Proven efficacy  
for bubonic  
plague only**





# Treatment - Clinical



- **Supportive therapy**
  - I.V. crystalloids
  - Hemodynamic monitoring
  - Supplemental oxygen
  - Clinically significant hemorrhage is rare
  - I&D of buboes is usually contraindicated
- **Antibiotic therapy**





# Current Situation

## Worldwide Cases

- 1980 - 89      861 / year      11% mortality
- 1990 - 94      1974 / year      8%  
mortality

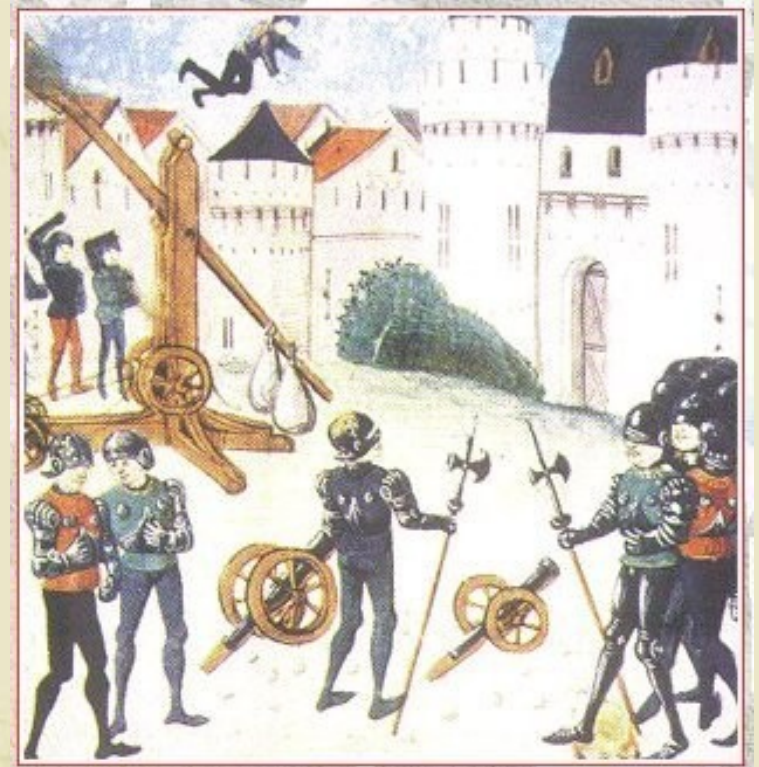


**The shaded areas show natural plague foci (in rodent populations).**



# Weaponization

- **Bubonic plague has been used as a biological weapons**
- **Use fleas to target humans and secondary transmission from rodents**
- **1346 - Black Sea Port of Kaffa**
  - Attacking forces catapulted bodies of plague victims over walls into city to cause epidemic







# Weaponization (cont.)

- **Dr. Shiro Ishii - Manchuria (1933-45) Unit 731**
- **“Bare germs” vs. carrier fleas**
- **300 kg fleas (one billion) / month**
- **Plague epidemic in Changteh, China during WWII**
- **Post WWII weapons research focused on Pneumonic form**





# Battlefield Response to Bubonic Plague

- Detect
- Protect







# Detection

- **Possible methods of detection**
  - Detection of agent in the environment
  - Clinical (differential diagnosis)
  - Medical surveillance (coordination enhances detection capability)
- **PVNTMED personnel test water and food sources**
- **Diagnosis of Bubonic Plague is not presumptive of a BW attack - Bubonic plague may be endemic in the area of operation**



# Detection of Agent in the Environment

- Biological Smart Tickets
- Enzyme Linked Immunosorbant Assay (ELISA) (Fielded with the 520th TAML)
- Polymerase Chain Reaction (PCR) (Fielded with the 520th TAML)







# Detection of Agent in the Environment (cont.)

- M31E1 Biological Integrated Detection System (BIDS)
- Interim Biological Agent Detector (IBAD)





# Clinical Detection

## Sudden presentation of:

- Malaise, high fever, and one or more tender lymph nodes
- Rapid progression of symptoms may occur







# **Clinical Detection Laboratory Confirmation**

- **Division medical assets lack lab equipment to conduct test to determine plague**
- **Specimen must be sent to theater level or CONUS lab**
- **Lab specimens should be submitted to the correct diagnostic laboratory**
  - Responsibility of the Lab Officer
  - Ensure the chain of command is aware of the situation
- **Contact lab prior to collection or**



# **Clinical Detection Laboratory Confirmation (cont.)**

**Points of contact for biological sampling  
and shipping**

- Corps Chemical Of
- Technical Escort U
- AFMIC
- 520th TAML
- USAMRIID
- WRAIR
- CDC







# Detection Medical Surveillance



MARYLAND ARMY NATIONAL GUARD  
DISCOM 29<sup>th</sup> Infantry Division (Light)  
DIVISION MEDICAL OPERATION CENTER (DMOC)



## Patient Summary Report 29<sup>th</sup> INF (L) DIV

From: Division Medical Operations Center (DMOC)  
To: Division Surgeon

Date Time Group: From: 121200RJUN99  
To: 202400RJUN99

### PATIENTS

| Nation | WIA | NBI | Disease | Neuropsychiatric<br>Stress-Related | Total |
|--------|-----|-----|---------|------------------------------------|-------|
| US     | 0   | 97  | 55      | 0                                  | 152   |
| Allied | 0   | 0   | 0       | 0                                  | 0     |
| EPW    | 0   | 0   | 0       | 0                                  | 0     |

### DISPOSITION

|                            |     |
|----------------------------|-----|
| Return to duty             | 148 |
| Holding in Division's MTFs | 0   |
| Evacuated and returned     | 3   |
| Evacuated by air           | 0   |
| Evacuated by ground        | 1   |
| Expired en route           | 0   |
| Expired in MTF             | 0   |

Clues in the daily  
medical disposition  
reports

- Unexpected high numbers of fevers, malaise, lymph node tenderness



# Protect Vector Protection

- Insect repellants containing DEET (N,N-diethyl-m-tolumaine) for skin
- Standard uniform clothing treated with insecticide sprays - permethrin
- Avoid dead animal and rodent nests

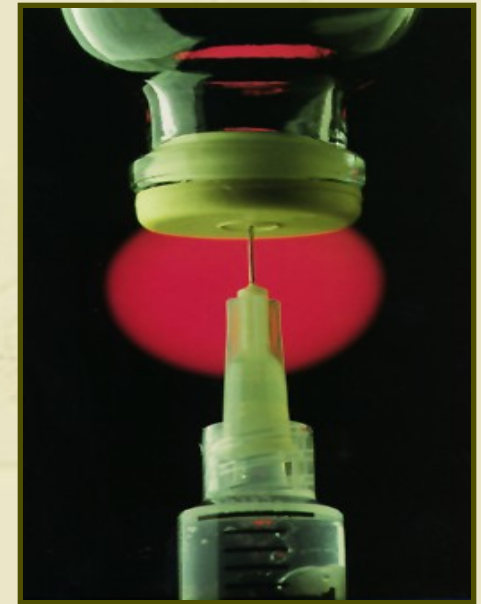






# Protect Vaccinations

- **Plague vaccine**
- **World War II - No Known Cases**
  - All troops received vaccinations
- **Vietnam War**
  - Americans (8 cases) vs. Vietnamese (1,000's)
  - All soldiers vaccinated





# Medical Response to bubonic plague

- Triage and Evacuation
- Infection Control
- Resource Requirements







# Triage and Evacuation

- **Triage**
  - Priorities based on severity of symptoms
  - Respiratory support needs will increase priorities
- **Evacuation - Delayed or Immediate (depending on severity of symptoms)**
  - Required of all patients in Echelons I & II
  - Echelons III & IV based on priority
  - Standard evacuation assets may be used
  - Observe standard infection control



# Evacuation or Quarantine



Figure 8-6. Arms carry.

- **Evacuation**
  - Plague patients not likely to RTD in the normal theater evacuation policy of 15 days
  - Strict interpretation of the doctrine calls for evacuation
- **Quarantine**
  - Contagious
  - Limit spread of the bacteria
  - Unlike smallpox, plague is already endemic to various parts of the world
- **Guidance**
  - Before evacuating patients suspected of plague, seek guidance from CINC

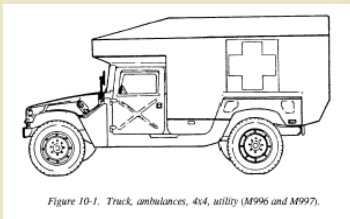


Figure 10-1. Truck, ambulances, 4x4, utility (M996 and M997).





# **Infection Control**

- **Mass immunization**
- **Plague is communicable from person to person with respiratory involvement - patients must be strictly isolated**
- **Universal precautions including respiratory precautions apply for patient handling**
- **Control of rodent population (PVNTMED)**
- **Care of patient remains - Quartermaster section**
- **Disinfection of areas and articles soiled by respiratory secretions**



# Resource Requirements

- **Evacuation Assets**
- **Supportive therapies**
  - IV antibiotics
  - Hemodynamic monitoring
- **Intensive care facilities for severe cases**
- **Isolation areas for infected individuals**
- **Quarantine, if imposed, would strain the supply chains**







# Command and Control

- **Intelligence**

- Medical surveillance and intelligence reports are key to keep the Command alert to the situation

- **Evacuation of the sick or Quarantine**

- **Maneuver**

- Quarantine may be necessary for identified cases

- **Logistics**

- Additional Class VIII materials will be required and evacuation routes to Echelon III will be heavily utilized

- **Manpower**

- An outbreak of bubonic plague may significantly reduce manpower in a short period of time



# **Command and Control Response to Psychological Impact**

- **May vary from person to person**
- **Psychological Operations**
  - Rumors, panic, misinformation
  - Soldiers may isolate themselves in fear of disease spread
- **Countermeasures**
  - LEADERSHIP is responsible for countering psychological impacts through education and training of the soldiers
  - Implementation of defensive measures such as crisis stress management teams





# Summary

- **Bubonic plague is highly infectious and can be transmitted from person to person**
- **Bubonic plague has been weponized**
- **Detection may not occur until after exposure when patients are reported**
- **Command decisions that will be required upon detection of bubonic plague:**
  - Evacuation or quarantine
  - Treatment: Procuring additional medical supplies
  - Infection Control: Elimination of vector sources.



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**Battelle Memorial Institute created this presentation for the U.S. Army Office of the Surgeon General under the Chemical Biological Information Analysis Center Task 009, Delivery Number 0018.**